reducible for all finite values of p and r. Let $p=5$, $r=5$. Then, ignoring constant factor 5, y^5+5y^3+5y+5 is reducible. But this is irreducible by the well known theorem of Eisenstein (Weber, l. c., p. 702).

The irreducibility may also be proved by setting $p=0$, $r=2$, whence the function y^5+2, which is irreducible by the theorem in Dickson's *Theory of Algebraic Equations*, p. 77, §90.

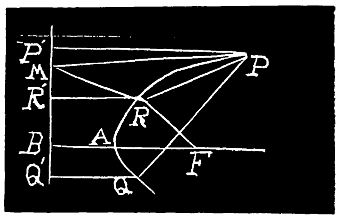
GEOMETRY.

332. Proposed by DAVID F. KELLEY, New York, N. Y.

To find the area of a parabolic sector, by a hitherto unpublished method.

Solution by the PROPOSER.

Let a secant meet a parabola in the points P and Q. Join the points P and Q to F which is the focus of the parabola. Let fall perpendiculars from P and Q on the directrix, BC, meeting it in the points P' and Q', respectively. Let R be any other point on the curve between P and Q. Join P and R, and let fall RR' perpendicular to directrix BC, and meeting it in the point R'. Bisect $P'R'$ in M, and join M and R, and M and P. By a well known geometrical theorem, area of $\triangle PMR=\frac{1}{2}$ quadrilateral $PP'R'R$. Let R' move indefinitely near to P', then, in the limit, $MR=R'R=FR$, and $NP=P'P=FP$. Therefore, in the limit, $\triangle PRF=\triangle PMR=\frac{1}{2}$ quadrilateral $PP'R'R$. Hence, it readily follows that space $FPRAQ=\frac{1}{2}$ space $PRAQQ'P'$. Hence, if O=space $PRAQQ'P'$, and I=space $PRAQ$, and $\triangle'$=area $\triangle FPQ$, and k=area of quadrilateral $PQQ'P'$, we have the following two equations connecting O and I:



$$\triangle'+I=\tfrac{1}{2}O,\quad O+I=k.$$

In particular, when PQ is perpendicular to AB, if x and y be coordinates of P, we have $(a-x)y+I=\frac{1}{2}O$. $I+O=2(a+x)y$, and solving for I we get $I=4xy/3$.

Again, since, in the limit, $\triangle FPR=\triangle MPR$, it follows that if perpendiculars be let fall from P' and F on the tangent to the parabola at P, then these perpendiculars are equal, and hence it is readily seen since $FP=PP'$ that the line joining F and P' is bisected by the tangent at P, and is at right angles to it.

Also solved by G. B. M. Zerr, and H. V. Spunar.